

**Guidelines for  
Implementing Total Management Planning**

**Asset Management**

**ASSET EVALUATION AND RENEWAL  
Implementation Guide**



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## LIST OF ACRONYMS

CCTV	closed-circuit television
COAG	Council of Australian Governments
EPP (Water)	Environmental Protection (Water) Policy 1997
GIS	geographical information system
GPS	geographical positioning system
IBS	integrated business system
IF	importance factor
KPI	key performance indicator
LOS	level of service
RDBMS	relational database management system
SQL	standard query language
SWOT	strengths, weaknesses, opportunities, threats
TMP	Total Management Plan
WSP	Water Service Provider

# 1 PURPOSE

This guide is intended to provide guidance for water service provider (WSP) practitioners and their consultants on the processes involved in establishing and implementing effective asset evaluation and renewal strategies and procedures and developing associated documentation.

# 2 INTRODUCTION

## Outcomes

Effective asset evaluation and renewal will allow a WSP to have an intimate knowledge of:

- assets it has under its control;
- the location of these assets;
- the value of these assets;
- the condition and performance of these assets;
- the approximate residual life of these assets; and
- prioritised projections of asset replacement or rehabilitation costs.

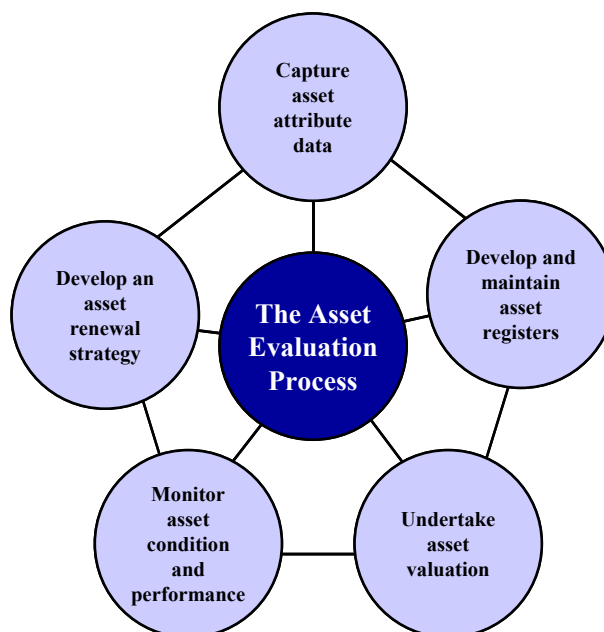
## Outputs

Outputs from the asset evaluation and renewal process include:

- an Asset Evaluation and Renewal Plan (TMP sub-plan);
- asset registers which can be presented in text or graphical outputs;
- asset condition/performance reports;
- asset valuation reports;
- specific asset management studies; and
- a prioritised asset replacement/rehabilitation program.

# 3 THE ASSET EVALUATION AND RENEWAL PROCESS

The asset evaluation process is illustrated in Figure 1.



**FIGURE 1: The asset evaluation process**

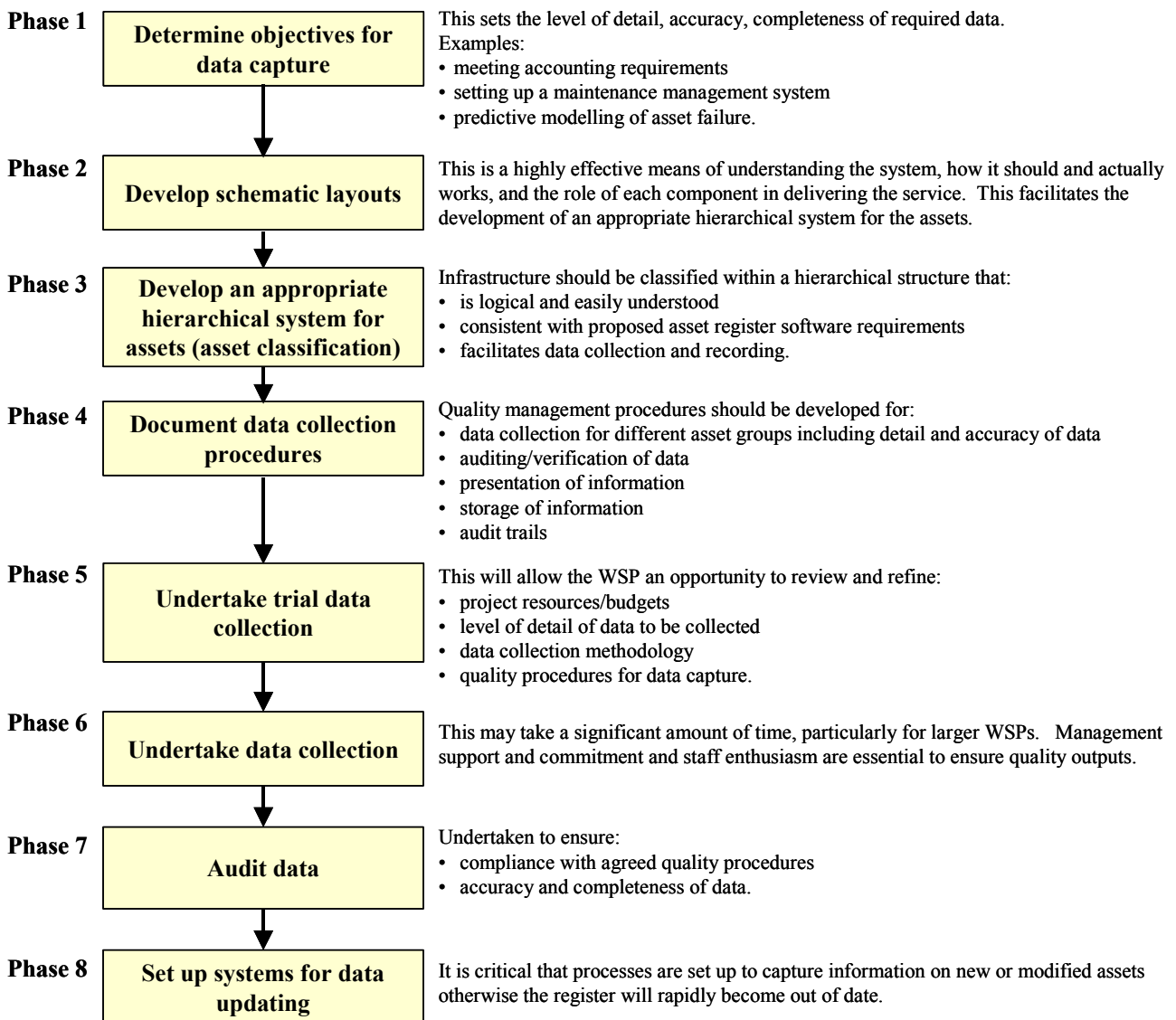
### 3.1 Capturing asset attribute data

The initial data collection requires significant resources (human and financial). In the early and mid-1990s most Queensland WSPs captured information relevant to their assets. Data was collected from a range of sources including:

- drawings and contract documents;
- operation & maintenance manuals;
- inspection and measurement of assets;
- geographical positioning systems, for asset location;
- photogrammetric mapping; and
- digitising of existing drawings.

Processes are also well established to capture new and/or modified asset data. Unless updating processes are rigorously enforced, however, the asset database will gradually deteriorate and become unreliable and useless. Financial auditors are also keen to ensure integrity of the asset register information.

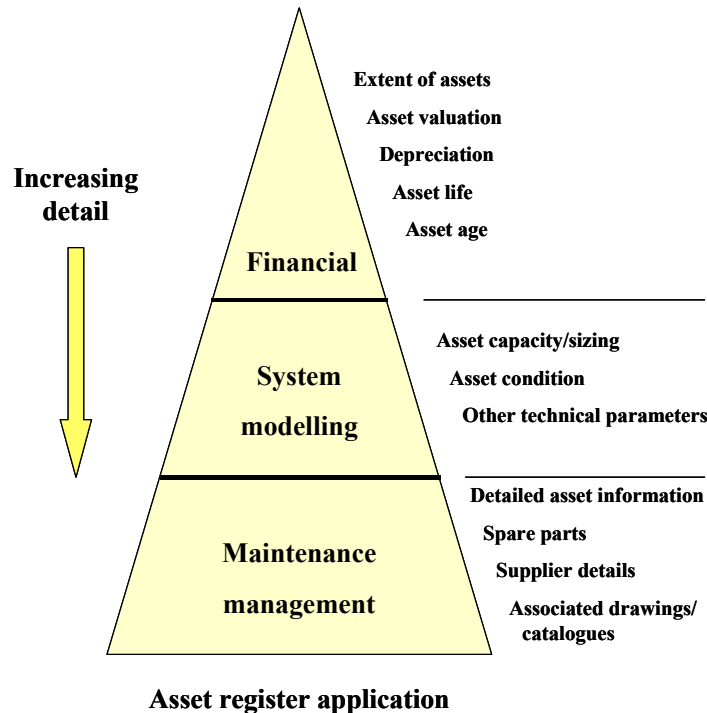
The data capture process can be extremely expensive, so it is essential that the process is well planned. The steps are illustrated in Figure 2.



**FIGURE 2: The asset data capture process**

### 3.2 Developing and maintaining asset registers

An asset register includes information on asset description, location, condition, residual life and asset current costs, depreciation and value. Asset registers are useful to a wide range of personnel. These include financial managers, engineers, maintenance managers and staff. The type of information required by various groups is shown in Figure 3. The level of detail contained in the registers will vary to suit the required user group.



**FIGURE 3: Asset register types**

This section outlines key issues to be considered when developing an asset register. The type of register described can be classified as suitable for financial managers and for system modelling. Asset registers appropriate for maintenance management will require more detail.

#### Establishing the asset register

It is all too easy to get caught up in the development and establishment of computer systems rather than the collection, collation and use of basic information. For most WSPs, therefore, it is much better to purchase a cheap, readily available commercial database and spend most of the money on collecting and using the data (i.e. developing an asset renewal plan, undertaking financial planning, etc.).

Cheap, simple databases, spreadsheets or geographical information systems (GIS) can serve as effective, low-cost entry points for many WSPs establishing a formalised asset management system. Data can be readily transferred from most simple databases to more sophisticated computer systems at a later stage. However, larger WSPs with significant resources and management commitment may find it cost-effective to develop a detailed asset register as part of an integrated asset management package.

#### Information requirements

Before commencing an asset register (and related data capture), WSPs should critically assess what information is required from the register, by whom, and to what level of detail — now, in 5 years and in 10 years' time. The outcome of this assessment will help to determine the degree of integration, now and in the future, with:

- other registers;
- financial management system;
- maintenance management system; and
- geographic information systems (GIS).

From this information, an implementation plan can be produced for cost-effective development of an asset register.

An asset register will include:

- a unique asset identification number;
- asset location/description;
- basic dimensions;
- material;
- year constructed;
- importance level for asset;
- useful life;
- condition rating;
- residual life;
- current cost;
- accumulated depreciation;
- written-down current cost; and
- annual depreciation.

### **Level of asset disaggregation**

This will depend on what the register is to be used for. For financial asset registers, asset disaggregation should be based on the asset having a single useful life and the applicability of cost data.

### **Screening process**

It is important that a sound screening process be applied before data is entered in the asset register, to ensure that financial reporting provides a true picture of the infrastructure. The screening process can be undertaken relatively quickly, initially on a macro basis and then at a facility level. The screening process would involve confirming the asset and applying the deprival test, as described below.

- Confirming the asset:
  - Does the WSP control the asset?
  - Does the asset have a service potential?
  - Can its value be reliably measured?
  - Is its value likely to be material?
- Applying the deprival test:
  - Would the asset's service potential be restored following rehabilitation to the deprival value?

### **Asset numbering systems**

A number of asset numbering systems exist, including:

- unintelligent (random sequential numbers);
- semi-intelligent; and
- fully intelligent.

The issue of asset numbering systems becomes less relevant where the system (with or without a GIS):

- incorporates standard query language; or
- is a relational database management system; or
- is a fully integrated business system.

### **Asset's level of importance (criticality)**

Within a water/sewerage or irrigation scheme, some assets are more important or more critical than others, on the basis of whether their function is related to level of service and the cost of correcting a preventable breakdown. Assigning an importance factor (IF) to each asset provides an indication of its relative importance and the consequence of its failure. This rating will assist in objectively determining and prioritising maintenance or replacement strategies for that asset. A suggested rating system for the asset register is a scale of 0 to 5 (where 5 indicates the most critical importance). Examples of these criteria are shown in Table 1.

**TABLE 1: Criteria For asset importance**

Importance factor	Effect of failure of asset
Highest (4–5)	<ul style="list-style-type: none"> <li>▪ Immediate and unacceptable impact on the levels of service; or</li> <li>▪ large number of consumers affected; or</li> <li>▪ results in considerable cost to the WSP; or</li> <li>▪ affects the safety of WSP staff or the community.</li> </ul>
Middle (2–3)	<ul style="list-style-type: none"> <li>▪ Probably has an adverse effect on the levels of service; or</li> <li>▪ medium number of consumers affected; or</li> <li>▪ likely to cause long-term problems which are costly to rectify; or</li> <li>▪ potentially unsafe conditions may result for WSP staff or the community.</li> </ul>
Lowest (0–1)	<ul style="list-style-type: none"> <li>▪ Probably will not adversely affect the levels of service; or</li> <li>▪ small number of consumers affected; or</li> <li>▪ cause minor cost to the WSP; or</li> <li>▪ unlikely to affect the safety of WSP staff or the community.</li> </ul>
<p>Within each rating level, the following factors may influence the importance of an asset:</p> <ul style="list-style-type: none"> <li>▪ building damage</li> <li>▪ effect on business and essential service;</li> <li>▪ damage to other utilities; and</li> <li>▪ traffic disruption.</li> </ul>	

An alternative and more refined rating system is illustrated in Table 2.

**TABLE 2: Alternative rating system for importance of a pipeline**

	Importance criteria	Severity	Score (S) 1 to10	Weighting (W) 1 to 5	Score (S x W)
1a	Number of customers serviced by pipeline	<10	2		
		>10 <50	5		
		>50 <200	8		
		>200	10		
1b	Type of customers serviced by pipeline	Mainly industrial area	3		
		Mainly residential area	5		
		Mainly commercial area	8		
		High safety risk, e.g. hospitals	10		
2	Public health and safety	No effect	0		
		Minor — single illness or injury	4		
		Major — multiple illnesses or injury	10		
3	Environmental impact	No effect (flows contained)	0		
		Minor impact	4		
		Major impact	10		
4	Cost of repair	<\$5000	2		
		>\$5000 <\$10 000	4		
		>\$10 000 <\$15 000	6		
		>\$15 000 <\$20 000	8		
		>\$20 000	10		

	Importance criteria	Severity	Score (S) 1 to 10	Weighting (W) 1 to 5	Score (S x W)
5	Time to repair	<1 day	2		
		1–3 days	4		
		>3 days	10		
6	Disruption to traffic	No access or road disruption	0		
		Minor access disruption	2		
		Important access disruption	4		
		Minor road disruption	5		
		Major road disruption	10		
	TOTAL				

From draft NSW *Renewals Guidelines* 1998.

Pipelines would be assigned importance ratings A, B and C based on the total weighted score determined using Table 2.

### Useful life

The useful life of an asset is the lowest of:

- the period where the asset will provide the designated level of service at an economic cost; or
- the period by which time the asset will be technologically obsolescent; or
- the period by which time the asset's service potential is no longer required.

An asset's useful life will depend on a number of factors that include material, construction methods, design criteria, location, loading, pressure, environmental conditions and level of maintenance. Table 3 provides indicative asset useful lives that may be suitable as an initial estimate of asset life. This estimate can be refined during the development of the initial asset register by:

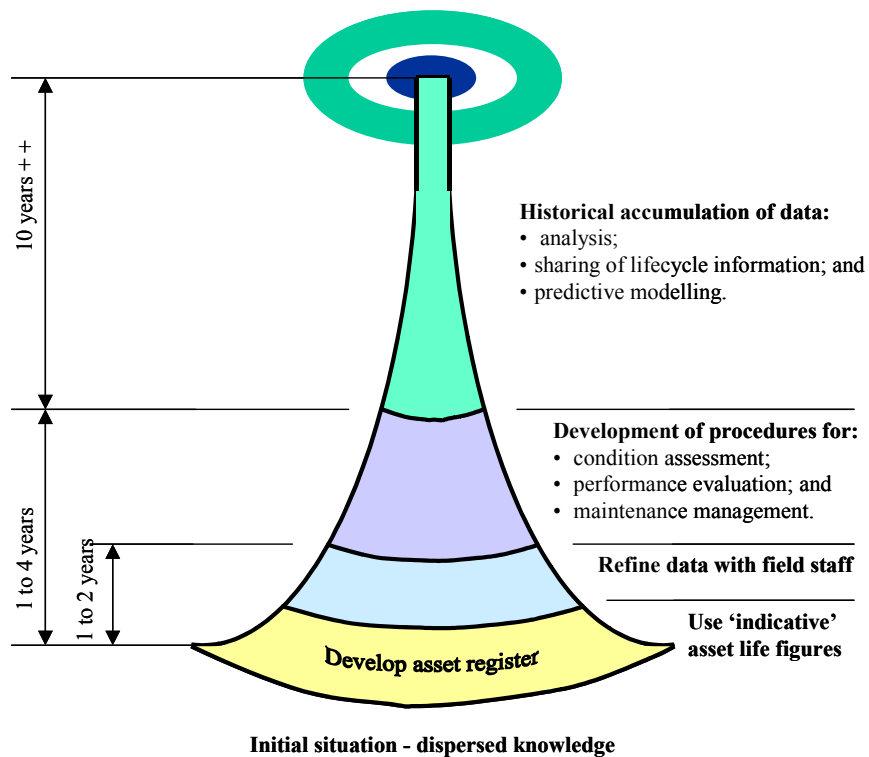
- calculating the estimated replacement year. If this calculation produces an unrealistic result, then the useful life should be modified to reflect a more realistic value;
- using information already being collected on asset condition or performance (e.g. record of main breaks, sewer inspection records); and/or
- discussion with field staff on asset performance.

A formal asset management system should provide information on asset condition or performance so that realistic asset life estimates can be developed and refined on an ongoing basis. This is discussed in Section 2.4. The refining of asset life estimation is illustrated in Figure 4.

**TABLE 3: Indicative useful lives**

Asset	Indicative useful life (years)
Dams	150–200
Weirs	50–125
Bores	50–80
Irrigation channels (earthworks)	150

Asset	Indicative useful life (years)
Irrigation channels (concrete lining)	50
Irrigation channels (clay lining)	50
Water-retaining structures	80
Steel structures	60
Buildings and other structures	60
Pumps, compressors, process plant and other mechanical equipment	15–25
Electrical equipment	15–25
Telemetry and instrumentation	10
Meters	15
Fences/ladders/rails	25
Water pipelines	50–80
Services	50
Hydrants	30–50
Valves	25–50
Control valves	15
Sewers (gravity and pressure)	50–80
House connections	50
Manholes	40–60



**FIGURE 4: Refining asset life estimation**

## Asset condition scale

An asset register should provide a quick guide to the condition of the assets by means of an appropriate condition scale. Examples of simple condition scales are shown in Tables 4 and 5. Some scales (e.g. Table 4) give 5 as the best condition, whereas others nominate 1 as the best condition. Obviously the WSP will need to have a consistent system.

The assessment method illustrated in Table 5 can be refined for different asset groups, with comments relevant to specific groups (e.g. electrical or mechanical).

Table 6 outlines a sample qualitative condition rating for civil irrigation assets. This rating has a scale of 1–6.

**TABLE 4: Example of an asset condition scale**

Condition rating	Asset condition (taking into account asset age)
1	Excellent
2	Good
3	Average
4	Fair
5	Poor
6	Unserviceable

**TABLE 5: An alternative condition scale**

Condition rating	Asset condition	Description	Alternative description (e.g. for a pipeline)
1	Perfect/excellent	Only normal maintenance required.	Expected residual life >50 years
2	Minor defects only	Minor maintenance required (5%)	Expected residual life 20–50 years
3	Backlog maintenance required	Significant maintenance required.	Expected residual life 6–20 years
4	Requires major renewal	Significant renewal/ upgrade required.	Expected residual life 2–5 years
5	Imminent failure	Over 50% of the asset requires replacement.	Expected residual life <1 year
6	Asset failed	Total replacement required	Zero residual life

### 3.3 Undertaking asset valuation

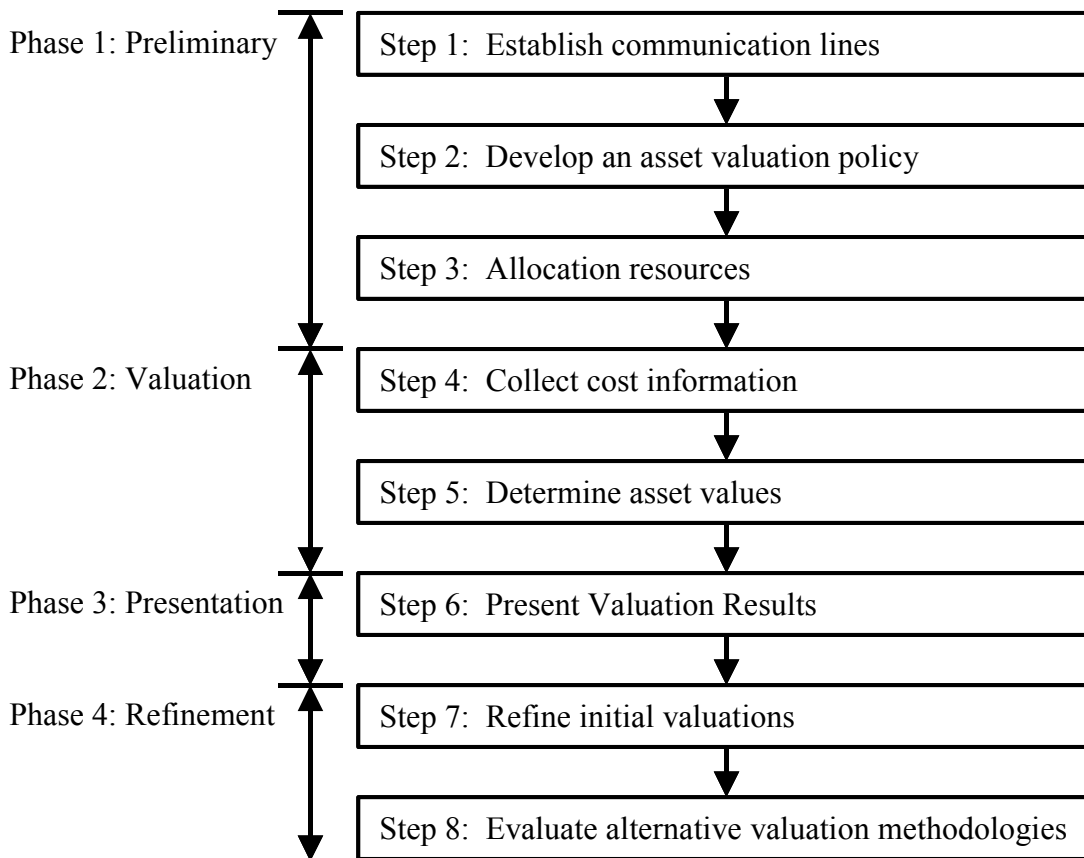
Publicly owned WSPs are required, through relevant account standards, to value their assets at current value. Effective asset valuations are critical to the management of a WSP for the following reasons:

- to ensure compliance with regulatory requirements;
- to reflect the value of assets to stakeholders;
- to measure the financial performance of the WSP; and
- to enable consistent benchmarking of the financial performance of the WSP with similar agencies.

The valuation process can be separated into three major parts:

- preliminary work;
- determining asset values; and
- presentation of results.

The process is illustrated in Figure 5 and fully explained in Appendix A. While all four Phases are critical for successful valuation, the first phase is the most crucial. If the valuation process is well thought out and planned, and information effectively communicated to relevant staff, the process can be implemented correctly, cost-effectively and at the first attempt.



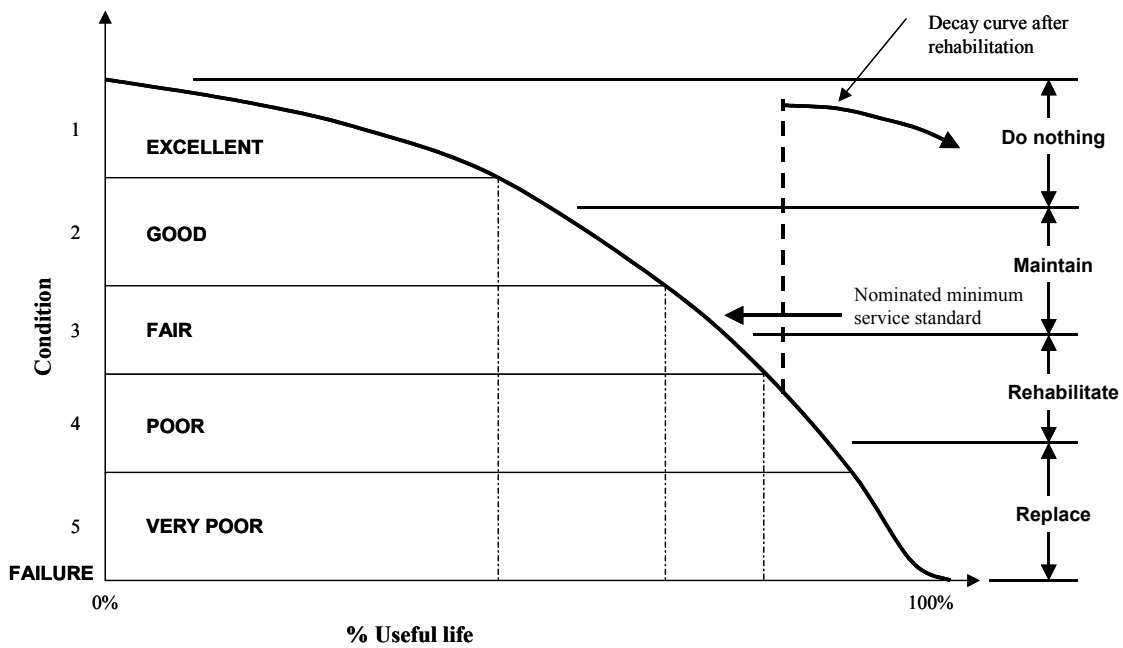
**FIGURE 5: The asset valuation process**

### **3.4 Evaluating asset condition and performance**

The purpose of asset condition and performance evaluation is to:

- trigger asset maintenance (condition-based or predictive maintenance);
- identify assets requiring rehabilitation and replacement in the short and medium term; and
- provide raw data for developing and/or calibrating asset deterioration/failure models.

Figure 6 illustrates a typical condition decay curve for infrastructure assets. In many instances condition assessment may only identify assets that are well into their useful life and in need of replacement or rehabilitation.



**FIGURE 6: Typical condition decay curve for infrastructure assets**

Any condition/performance evaluation process should possess the following characteristics:

- **repeatability** — the same condition rating will be determined if a different person performs the rating;
- **objectivity** — the rating can be measured on the basis of some physical characteristics such as cracking;
- **simplicity** — simple systems are easier to use and generally lead to more consistent results.

Table 6 illustrates a structured qualitative condition assessment for civil irrigation assets which was developed in the Victorian rural water industry in the early 1990s. The method allows a large number of assets to be assessed in a relatively short period of time.

**TABLE 6: Sample qualitative condition rating**

Condition Type	1	2	3	4	5	6
Channel embankments	Recently constructed, remodelled, replaced, or rehabilitated	Some wear and tear but no operational problem or likely leakage or breaks	Reduced bank cross section causing operational problems or leaks	Significantly reduced bank cross section and loss of freeboard. Operational difficulties and potential for collapse and/or significant seepage loss.	Severely reduced bank cross section causing intermittent breaching or overtopping and/or severe leakage or seepage through bank	Bank in state of collapse with continuous breaching, overtopping and/or extreme leakage or seepage through bank
Channel waterway	Recently constructed, remodelled, replaced, or rehabilitated	Routine weed removal required or lining or with minor cracking	Occasional desilting or mechanical weekly removal required or lining with sufficient cracking to require minor patching	Frequent desilting or mechanical week removal required or lining moderately cracked and some patches missing.	Major desilting or mechanical week removal required or lining extensively cracked and missing	Effectively blocked required remodelling or lining effectively collapsed and losses unacceptably high
Pipelines	Recently constructed, remodelled, replaced, rehabilitated	Very occasional bursts or blockages. Scouring de-weeding, minor fittings maintenance required	Burst frequency still acceptable, moderate fitting maintenance or some minor blockages, collapses, joint movement	Some water quality problems. Bursts frequently approach maximum acceptable and moderate fittings maintenance or some major blockages, collapses or joint movement	Major water quality problem due to pipe condition. Frequent bursts, major fittings maintenance or blockages, collapses and severe joint movement	Bursts frequently significant above maximum acceptable level and fittings effectively unserviceable or fully blocked, collapsed or joints failed
Access tracks (earth or gravel)	Recently constructed, remodelled, replaced, rehabilitated	Some wear and tear but no access difficulty	Minor deterioration of track formation and structure. Potentially difficult and unsafe use	Significant deterioration of track formation and structure. Access difficult and unsafe	Severe deterioration of track formation and structures. Deep ruts, access slow and unsafe	Access effectively unusable

<b>Condition</b> <b>Type</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
Fencing	Recently constructed, remodelled, replaced, rehabilitated	Some wear and tear but still provides good security	Minor deterioration of post and wire reducing security	Significant deterioration of post and wire reducing security	Severe deterioration of post and wire. Collapse imminent	Collapsed or unserviceable
Bridges, culverts, siphons, flumes, weirs (minor), offtakes, regulators	Recently constructed, remodelled, replaced, rehabilitated	Some wear and tear but load capacity or operational performance not affected	Some structural cracking or significant wear and tear potentially causing loss of load capacity for bridges and culverts and operational difficulties for all structures	Significant structural cracking, undermining or repairs needed. Possible difficult operation and reduced load capacity for bridges and culverts	Severe structural cracking or undermining structure collapse or non operation of all or component parts imminent	Collapsed, undermined or damaged preventing correct wheel rotation or allowing significant leakage or bypass of water either internally or externally
Meter outlet emplacements	Recently constructed, remodelled, replaced, rehabilitated	Some minor visual deterioration but no operational problem and measurement accuracy not affected	Some structure cracking or deterioration but undermining and leakage unlikely. Operation and measurement accuracy not affected	Significant cracking or deterioration with potential undermining and leakage or bypassing of water either externally or internally	Severe cracking, undermining or damage allowing some leakage or bypass of water. Imminent interference to wheel rotation	Structure in total or component effectively collapsed or so damaged to be unserviceable

From Burns and Godkin 1991.

A WSP will use a number of condition and performance monitoring techniques, a summary of which is included in Table 7. Many of these activities will be incorporated into a WSP's planned maintenance program or operational data analysis, monitoring and reporting. WSPs will define criteria for establishing a consistent condition rating for each asset group. In some instances, for example a closed-circuit television (CCTV) evaluation of sewers, standard approaches and specialist software are available to determine condition of assets.

**TABLE 7: Typical methods for evaluating the condition and performance of assets**

<b>Asset</b>	<b>Typical asset condition/performance evaluation method</b>
Dam	Visual inspection Instrumentation monitoring
Weir	Visual inspection
Structures/buildings	Visual inspection Non-destructive testing
Pumps/meters	Number of breakdowns Condition monitoring (e.g. vibration analysis) Efficiency (e.g. kW.h/ML, amperage)
Electrical switchgear/control panels	Number of breakdowns Visual inspection Condition monitoring (e.g. thermography) Proving operation
Water mains	Number of breakdowns Opportunistic inspection (in-ground) Visual inspection (above-ground) and internally for larger diameter mains Efficiency friction factor 'C' value or kW.h/ML Leakage level Intelligent pigging Water quality complaints Flow/pressure complaints
Services	Number of service breaks
Meters	Calibration Number of breakdowns Number of consumer billing complaints
Irrigation channels	Visual inspection
Sewer mains	Number of structural failures Number of blockages Number of overflows Number of odour complaints Visual inspection (CCTV) Void detection (wave impedance)
Manholes	Visual inspections Vacuum testing

Due to the extensive nature of assets and the resources required to monitor their condition and performance, a risk-based approach may need to be developed to prioritise their assessment, particularly where the assessment is relatively expensive (e.g. CCTV inspections of sewers).

Table 8 illustrates a decision matrix to assist the prioritisation process. As a WSP develops greater knowledge of its infrastructure, the methodology can be further refined.

**TABLE 8: Sample decision matrix for prioritising sewer inspection**

Preliminary condition rating	Asset importance level		
	A	B	C
5 (poor)	Immediate assessment	Immediate assessment	Assessment within 12 months
4	Immediate assessment	Assessment within 12 months	Assessment within 3 years
3	Assessment within 12 months	Assessment within 3 years	
2	Assessment within 3 years		
1 (excellent)			

Derived from NSW *Renewals Guidelines* 1998.

The preliminary condition rating may be based on such factors as age of the asset, material type or asset performance history (formally and informally recorded).

### 3.5 Developing an asset renewal strategy

In many instances, the identification of future asset renewal costs and addressing the prioritisation and funding of these liabilities are among the greatest challenges facing WSPs, particularly where a large part of the infrastructure is nearing the end of its useful life. Questions that arise include the following:

- Are residual life estimates correct?
- Are the replacement costs reasonable?
- How will we fund this expenditure?
- What will be the impacts (particularly on our customers) if we defer asset replacement/rehabilitation?
- What would happen if we spent more on planned/predictive maintenance practices?

It is therefore essential that each WSP has an asset renewal strategy to:

- optimise expenditure on asset rehabilitation and maintenance;
- plan ahead, particularly for funding asset replacement or rehabilitation; and
- review the existing stock of infrastructure to determine whether existing infrastructure as it approaches the end of its useful life should be:
  - replaced with a similar asset;
  - replaced with larger capacity infrastructure as part of an augmentation program;
  - replaced with smaller capacity infrastructure as customer demands have reduced; or
  - disposed of.

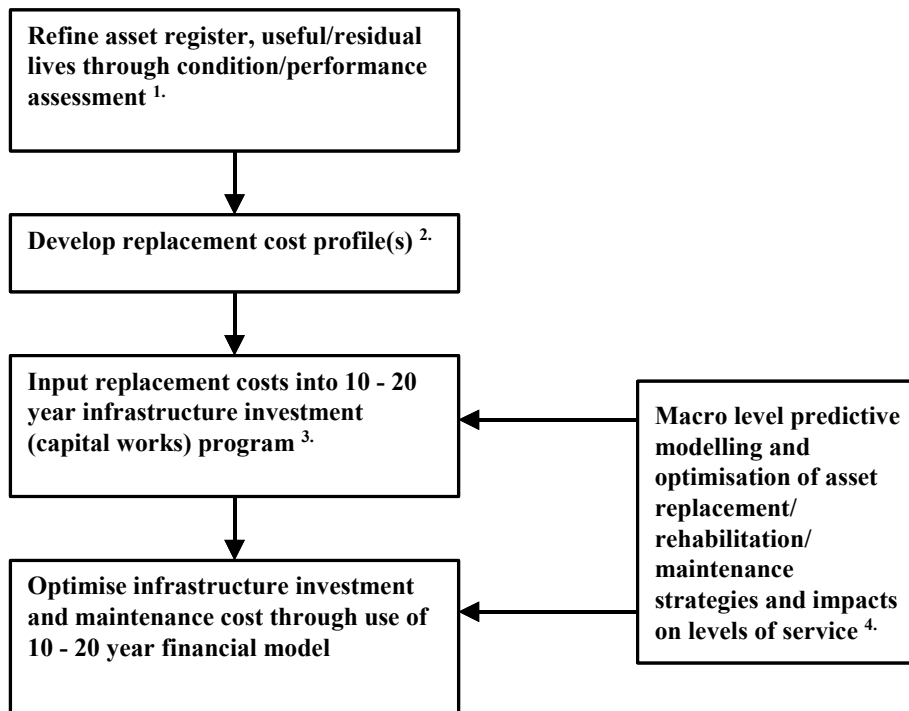
The renewal strategy should be developed in two stages:

- macro (strategic) level; and
- micro (detailed) level.

#### Strategic level

The macro level (strategic) approach to developing an asset renewal strategy is illustrated in Figure 7 and explained below. The purpose of this stage is to develop:

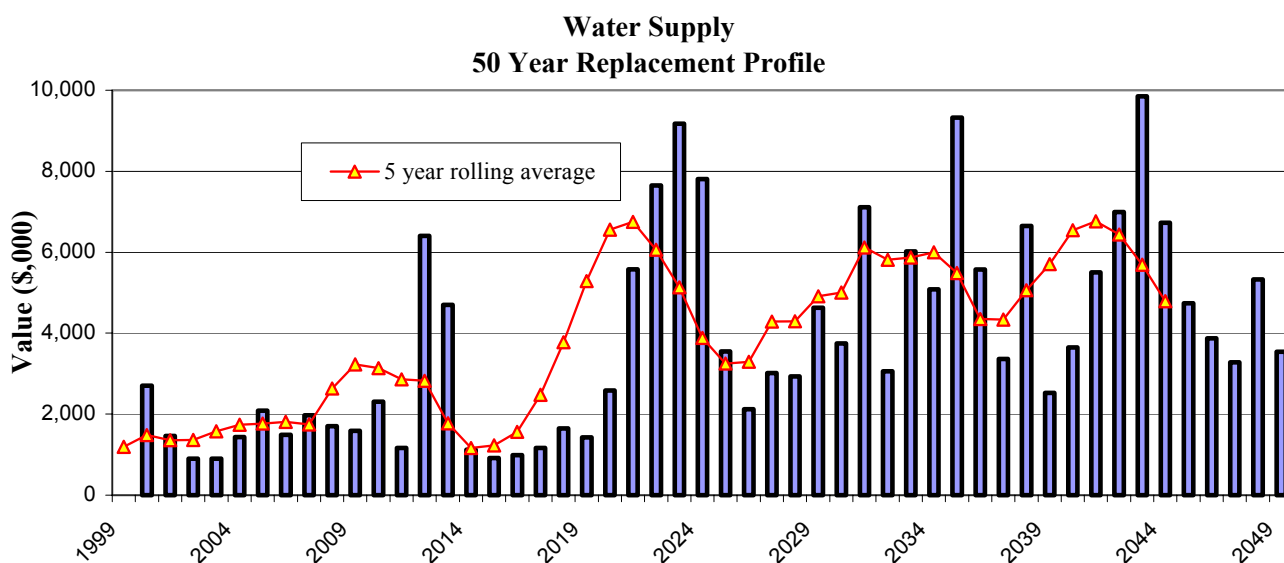
- short-, medium- and long-term cost estimates; and
- funding strategies for asset replacement/rehabilitation.



**FIGURE 7: Development of a macro level asset renewal strategy**

### **Explanatory Notes for Figure 7**

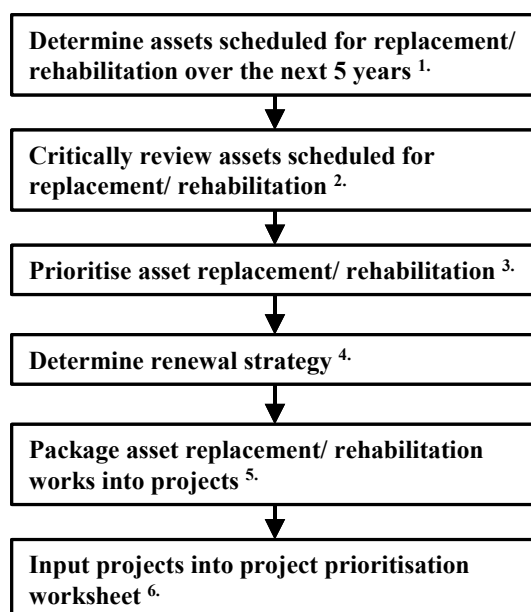
1. At the strategic level, cost estimates are derived for asset replacement/rehabilitation over the next 30-50 years. Over time useful/residual life estimates used for asset registers will be refined through condition and performance assessment.
2. It may also be desirable to develop a range of profiles based on various asset life scenarios. A further refinement is to develop a normal distribution (bell curve) of asset useful life around an assumed asset life. (Refer Figure 8).
3. Rolling 5-10 year average replacement costs derived from the replacement cost profile may be input into a 10-20 year infrastructure investment program linked into the 10-20 year financial model. Financial modelling will allow the WSP to determine financial impacts of the proposed asset renewal costs and allow the WSP to either:
  - determine financial strategies to fund the renewal; or
  - based on financial constraints set upper limit targets for asset renewal budgets.
4. Spreadsheet based models based on calibrated asset degradation curves can be a useful tool to allow a WSP to estimate anticipated infrastructure failure (and hence service standards) based on a range of maintenance and rehabilitation scenarios/budgets. The models can then be used to develop an optimum maintenance/asset rehabilitation budget for an asset group (e.g. water mains). These budgets can form an input into the 10-20 year financial model.



**FIGURE 8: Asset replacement cost profile**

#### Detailed level

The micro level (detailed) approach to developing an asset renewal strategy is illustrated in Figure 9. The purpose of this stage is to clearly identify and prioritise asset renewal projects.



**FIGURE 9: Development of a micro level asset renewal strategy**

#### Explanatory Notes for Figure 9

1. If the asset register is well maintained with asset residual lives that reflect asset condition and performance evaluation results, then assets requiring replacement or rehabilitation over the next 5-10 years can be readily determined.
2. It will be necessary to critically review the assets listed for replacement/rehabilitation, particularly in the early stages of formalised asset management. Operational staff who have intimate but informal knowledge of asset performance should be consulted during this stage.

3. A sample process for a water or sewer main renewal prioritisation is illustrated in Table 9. Different prioritisation matrices should be developed for different asset groups (eg electrical/mechanical assets). This simple process can be refined as WSPs asset management processes develop. The prioritised list of assets should be reviewed by operational staff to confirm/refine the results.
4. Options including:
  - replacement with an asset of similar capacity;
  - replace with a larger capacity asset as part of an augmentation program;
  - replace with a smaller capacity asset because customer demands have reduced and are unlikely to increase substantially in the future;
  - rehabilitate the existing asset (e.g. lining of an existing sewer);
  - increase level of maintenance; or
  - dispose of the asset.

Asset disposal may be an option where:

- the asset is surplus to requirements;
  - the service could be more cost-effectively delivered by other means (eg tankering of water); or
  - there are potential risks associated with the asset (e.g. vandalism, financial, environmental, legal).
5. These modules should be an appropriate size for contracting work to internal or external contractors.
  6. These project modules would need to be prioritised against other infrastructure projects as outlined in the Infrastructure Planning Implementation Guide. Alternatively a WSP may have already determined an appropriate asset renewal budget (as outlined earlier in this section). In this case the prioritised project modules whose aggregate total comes within the budget will be funded.

**TABLE 9: Sample asset renewal prioritisation matrix**

Preliminary condition rating	Asset Importance Level		
	A	B	C
5 (poor)	Replace/rehabilitate within 1 year	Replace/rehabilitate within 1 year	Replace/rehabilitate within 5 years
4	Replace/rehabilitate within 3 years	Replace/rehabilitate within 5 years	Replace/rehabilitate within 10 years
3			
2			
1 (excellent)			

Derived from NSW *Renewals Guidelines* 1998.

## 4 RISK ISSUES

Potential risks associated with asset evaluation and renewal include:

- inappropriate level of data capture (too coarse/too detailed);
- inaccurate data;
- registers becoming outdated due to lack of maintenance;
- inappropriate useful life estimates (over- or underestimate);
- over- or underestimation of asset values;
- inappropriate or sub-optimal asset renewal/rehabilitation investment;
- non-compliance with financial audit requirements;
- unreliable outputs; and
- selection of inappropriate software for information management.

## 5 TMP REQUIREMENTS

Each WSP's Total Management Plan (TMP) should include an outline of key issues and identified strategies addressing these issues for the WSP's services in respect of asset evaluation and renewal. Appendix B provides indicative content and appropriate TMP development level for this sub-plan.

A hierarchy has been established to define the level to which a WSP should develop its plan under total management planning. This is discussed in more detail in the TMP Development Guide. The development level depends on the size of the WSP (in terms of the replacement cost of its assets).

## REFERENCES AND FURTHER READING

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## APPENDIX A: Asset Valuation Process

### Phase 1: Preliminary Work

#### Step 1: Establish communication lines

Except for very small organisations, a steering committee is essential to ensure that key players are involved and committed to the process. Regular consultation with the internal/external auditor also is highly desirable to ensure that expensive mistakes are avoided.

#### Step 2: Develop an asset valuation policy

This is a prerequisite for asset valuation because:

- it focuses a WSP's requirements and expectations. The valuation policy demonstrates that WSP officers will have thought through the valuation process and documented their requirements. It also demonstrates agreement of the process by senior management;
- a well developed policy can be used as a basis for briefing external consultants and internal staff;
- a well developed policy will assist the audit process.

#### Step 3: Allocation Resources

Could be undertaken by internal and/or external resources. WSPs should also consider the relative level of resources allocated to various asset groups. For instance it would be more cost-effective for a WSP with water mains (usually accounting for 60 – 80% of total asset value) to devote more valuation resources to these network assets rather than to an asset group which may account for less than 5% of total asset value.

Personnel involved should:

- have a working knowledge of the engineering and financial aspects and audit requirements;
- understand and support the need for the asset valuation; and
- be properly briefed, in writing.

The valuation brief should clearly specify the outputs required, for example:

- valuation report;
- spreadsheet summaries;
- detailed calculations to be retained/controlled.

### Phase 2: Determine Asset Values

#### Step 4: Collect current cost information

Information sources include:

- recent contracts in the WSP area (or adjacent area) with indexing of contract prices less than 5 years old;
- day labour costs (provided they reflect the true cost of service);
- unit rates from consultants (these should have been calibrated against local costs and accompanied by a valuation report that explains how the unit rates were derived); or
- full valuation by an external consultant (with supporting information).

Appropriate construction on costs (eg construction contingencies, design, supervision, administration) should also be included.

Generic cost graphs and rates should only be used as a check that the calculated current cost is in the right 'ball park'. Old contract sums (say last 20 years) can also be indexed to check the order of costs.

The valuer may need to take a range of approaches to valuation depending on availability of raw data, cost information, etc. (Refer to Note 1.)

**Step 5: Determine asset values**

To obtain the asset value (written down current cost) it will be necessary to subtract depreciation over the asset life to date from the current cost. Usually straight line depreciation is applied with the residual value of infrastructure being zero. A critical component of the valuation process is therefore useful life. Generic useful life information should be reviewed and refined to suit local conditions and experience by WSP officers. Reasons for deviations from generic useful lives should be documented.

**Phase 3: Presentation of Results****Step 6: Present valuation results**

This report is an essential conclusion to the valuation process as it:

- summary valuation information;
- provides elements of an audit trail; and
- documentation for the next valuation in 5 years time.

**Phase 4: Refinement****Step 7: Refine initial valuations**

Initial valuations can be improved through:

- developing systems for capturing construction costs for assets;
- ensuring registers are adequately maintained with information on WSP-constructed and donated assets;
- developing asset management systems for monitoring asset condition and performance to enable a better estimate of residual asset life.

**Step 8: Evaluate alternative valuation methodologies**

Alternatives include:

- renewal accounting; and;
- optimised deprival valuation.  
(Refer to Note 2.)

**EXPLANATORY NOTES****Note 1**

The current cost should be taken as the lower of reproduction and replacement costs, where both these are applicable.

Reproduction cost would apply where:

- no cheaper modern equivalent exists; and
- the service capacity is appropriate.

Replacement cost would apply where:

- the asset is not reproducible; or
- the asset is reproducible but a cheaper modern equivalent exists; or
- the asset is reproducible but replaced at a different service capacity.

## **Note 2: Refinement — evaluate alternative valuation methodologies**

### **Renewal accounting**

While current cost accounting (and current cost depreciation) has significant advantages, particularly in performance comparisons and making asset renewal, it has some disadvantages. The major disadvantage of current cost accounting for setting water and sewerage prices is the difficulty in convincing customers (particularly irrigators) that long-lived assets such as dams and irrigation channels would not have an indefinite life if the assets were effectively maintained.

Renewal accounting requires estimating the timing and cost of replacing essential infrastructure, with regard to risk of failure and the hazard should failure occur. The cash flow required to fund the necessary renewal of infrastructure over an extended period is built up from a study of all the infrastructure assets in turn. An annuity is calculated to smooth out fluctuations in cash flow over the annuity period. Depreciation is then defined in terms of the renewal annuity.

### **Optimised deprival valuation (ODV)**

The optimised deprival valuation approach has been applied by corporatised electricity authorities in Australia (including Queensland) and New Zealand, and by some Australian and New Zealand water authorities, for determining the market value of a utility as a starting basis for commercial operations, and for rationalising performance comparison. In respect of the water industry, no Council of Australian Governments (COAG) guidelines related to the ODV methodology have as yet been published.

The ODV of an asset is the lower of optimised depreciated replacement cost (ODRC) and economic value (EV). Generally the latter will be based on the present value (PV) of future free cash flows (FCF), using the maximum long-term level of sustainable bulk supply charges.

The ODRC in valuing assets is a variation on the deprival value, in which the asset network is subjected to a technical evaluation as to how it would be reconfigured under current service demand forecasts and employing modern technology. As a result of the evaluation, certain assets might be concluded as being, for example, superfluous or oversized. The hypothetical reconfigured network is then revalued in terms of its written-down current cost to yield the ODRC.

The ODRC method involves the identification of modern equivalent assets where appropriate, and in this respect is no different from the normal deprival value approach. Where it differs is in requiring a comprehensive engineering review of the asset base, something that is normally neither required nor feasible in valuing infrastructure assets for financial reporting purposes.

## APPENDIX B: Content and development level of sub-plan

TABLE B1: Indicative sub-plan content

Sub-plan features	Asset Evaluation and Renewal Plan content
Issues covered in sub-plan	<ul style="list-style-type: none"> <li>▪ Asset data capture.</li> <li>▪ Registration.</li> <li>▪ Valuation.</li> <li>▪ Asset condition and performance assessment.</li> <li>▪ Asset replacement cost profile.</li> </ul>
Purpose of plan	<p>To provide summary information on:</p> <ul style="list-style-type: none"> <li>▪ the assets controlled by the WSP (extent, location, value, condition and performance);</li> <li>▪ asset register outputs; and</li> <li>▪ future asset evaluation strategies and actions for updating asset registers and refining useful life estimation.</li> </ul>
Policies that may be required	<ul style="list-style-type: none"> <li>▪ Asset valuation policy.</li> </ul>
Other Total Management Plan elements that are intimately linked to this sub-plan	<ul style="list-style-type: none"> <li>▪ Financial Management Plan: this requires asset register outputs such as current cost, value and depreciation; replacement cost profiles, and renewals annuity calculations.</li> <li>▪ Infrastructure Plan: replacement cost profiles will be input into the rehabilitation capital works program.</li> </ul>
External issues contributing to the current operating environment that need to be considered	<ul style="list-style-type: none"> <li>▪ Relevant accounting standards.</li> <li>▪ Developments in renewals annuity accounting.</li> <li>▪ Developments in optimised deprival valuation.</li> <li>▪ Developments in predictive modelling for asset failure.</li> </ul>
Issues that need to be considered in summarising the status of current operations	<p>An overview (including commentary) of the WSP's infrastructure should be provided, either as a summary table or graphic output. This might include:</p> <ul style="list-style-type: none"> <li>▪ scheme name;</li> <li>▪ component (e.g. weirs, treatment plants, mains);</li> <li>▪ quantity (e.g. length, number);</li> <li>▪ current cost;</li> <li>▪ written-down current cost; and</li> <li>▪ annual depreciation.</li> </ul> <p>A discussion on the current status of asset evaluation should include:</p> <ul style="list-style-type: none"> <li>▪ a description of the asset data captured, its accuracy and data capture methodology;</li> <li>▪ information on the extent of knowledge of asset location;</li> <li>▪ storage of asset register information (GIS, databases) and the linkage between these databases and other databases (e.g. financial). A flow chart (with accompanying explanatory notes) would be necessary;</li> <li>▪ a summary of asset condition and/or performance evaluation methodologies applied to different assets (e.g. mains, pump stations);</li> <li>▪ a summary of current asset condition/performance by asset type;</li> <li>▪ asset performance statistics (e.g. main breaks/100 km, sewer blockages/100 km, and comparison with average Queensland or Australian performance);</li> <li>▪ a 50-year asset replacement cost profile (with a commentary) that incorporates a 5-year rolling average and 20-year renewals annuity;</li> <li>▪ a description of any initiatives in predictive modelling of asset failure; and</li> <li>▪ Broad SWOT analysis of relevant operations.</li> </ul> <p>NOTE: This discussion could be presented in 5–10 pages maximum.</p>

Sub-plan features	Asset Evaluation and Renewal Plan content
Strategic basis of the plan	<p>The strategic elements forming the basis of the plan should include:</p> <ul style="list-style-type: none"> <li>▪ goal for asset management;</li> <li>▪ objective(s) for asset evaluation and renewal;</li> <li>▪ adopted KPIs; and</li> <li>▪ management strategies and performance targets.</li> </ul> <p>The management strategies developed will be based on the identified key strategic issues and SWOT findings, including risk assessment, in respect of asset evaluation and renewal, and on the required TMP development level.</p> <p>Many WSPs are likely to require strategies for refining asset residual life estimation.</p> <p>The strategies should be supported by detailed action plans that would cover a period of up to 3 years.</p>
Suggested performance measures	<p>Outcome:</p> <ul style="list-style-type: none"> <li>▪ average asset age by category.</li> </ul> <p>Output:</p> <ul style="list-style-type: none"> <li>▪ % length mains replaced or rehabilitated;</li> <li>▪ % length of trunk mains/channels at condition level 4 or worse;</li> <li>▪ % length sewers inspected with CCTV.</li> </ul>
Supporting documentation	<p>This will depend on the WSP, but would typically include:</p> <ul style="list-style-type: none"> <li>▪ asset registers;</li> <li>▪ asset valuation report; and</li> <li>▪ specific asset management studies.</li> </ul>

**TABLE B2: Required sub-plan development level**

Development level <sup>1</sup>	Target management mechanisms of Asset Evaluation and Renewal Plan
3	<ul style="list-style-type: none"> <li>▪ Asset registers integrated/linked with financial and maintenance management systems.</li> <li>▪ Assets valued to meet relevant accounting standards.</li> <li>▪ Registers regularly updated.</li> <li>▪ 50-year asset replacement cost profiles refined and optimised on basis of asset condition/performance assessment, predictive modelling and risk management.</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ Asset registers available, with assets disaggregated into civil, electrical and mechanical components.</li> <li>▪ Assets valued to meet relevant accounting standards,</li> <li>▪ Registers regularly updated,</li> <li>▪ 50-year asset replacement cost profiles refined and optimised on basis of asset condition/performance assessment.</li> </ul>
1	<ul style="list-style-type: none"> <li>▪ Basic asset registers available, with assets disaggregated into civil, electrical and mechanical components.</li> <li>▪ Assets valued to meet relevant accounting standards;</li> <li>▪ 50-year asset replacement cost profiles developed, with some refinement, on basis of asset condition/performance assessment.</li> </ul>

<sup>1</sup> Defined in Section 4.2 of TMP Development Guide.